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INSTALLATION RESTORATION PROGRAM PHASE 1 RECORDS SEARCH
FOR THE 167TH TAC. (U) HAZARDOUS MATERIALS TECHNICAL
CENTER ROCKVILLE MD MAR 86 DLA900-82-C-4426

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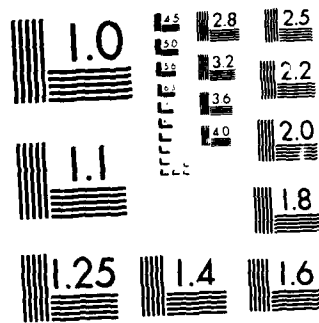
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107th Tactical Airlift Group
Shepherd Field, Air National Guard Base
Martinsburg, West Virginia

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INSTALLATION RESTORATION PROGRAM
Phase I - RECORDS SEARCH FOR
167th TACTICAL AIRLIFT GROUP
SHEPHERD FIELD AIR NATIONAL GUARD BASE
MARTINSBURG, WEST VIRGINIA

Submitted to:

Air National Guard Support Center
Andrews Air Force Base, MD 20331-6008

Submitted by:

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March 1986

Contract No. DLA 900-82-C-4426

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EXECUTIVE SUMMARY

A. INTRODUCTION

1. The Hazardous Materials Technical Center (HMTc) was retained in August 1985 to conduct the Installation Restoration Program (IRP) Phase I Records Search of the 167th Tactical Airlift Group (TAG), Shepherd Field Air National Guard Base (ANGB) under Contract No. DLA 900-82-C-4426.
2. The Records Search included a detailed review of pertinent installation records and an onsite base visit conducted by HMTc on August 19, 1985. Activities during the onsite base visit included interviews with six base employees, a site survey, and a search of base records.

B. MAJOR FINDINGS

1. The major operations of 167th TAG that have produced hazardous wastes include aircraft maintenance, ground vehicle maintenance, and fire department training. These operations generate varying quantities of waste oils, recovered fuels, and spent cleaners and solvents.
2. The waste materials generated by these operations ^{are being} ~~have been~~ disposed of by the Defense Reutilization and Marketing Office (DRMO) and by burning at the Fire Training Area (FTA).
3. Interviews with six base personnel and a field survey resulted in the identification of four disposal and/or spill sites at Shepherd Field ANGB. Three of the four sites were evaluated and prioritized using the Air Force's Hazard Assessment Rating Methodology (HARM).

C. CONCLUSIONS

1. Sampling by the 167th TAG bioenvironmental engineering technician before the Phase I study showed evidence of minor soil contamination at one of the three rated sites (Re: Appendix D, Parts A and B).
2. The groundwater at Shepherd Field ANGB is susceptible to surface contaminants due to the moderately permeable soils and the carboniferous bedrock underlying the area.
3. No evidence of offbase environmental stress resulting from past hazardous waste spills or disposal activities was observed in the immediate vicinity of Shepherd Field ANGB.

D. RECOMMENDATIONS

Because of the potential for contaminant migration at Shepherd Field ANGB, initial stages of the Phase II/IV-A IRP are recommended. The primary purposes for monitoring the proposed locations are:

- o To determine which pollutants are present at each site or determine that no pollutants are present.
- o To determine whether groundwater at each site has been contaminated, and if it has, give quantification with respect to contaminant concentrations, the boundary of the contaminant plume, and the rate of migration.

I. INTRODUCTION

A. Background

The 167th TAG is located on the Shepherd Field ANGB portion of the Eastern West Virginia Regional Airport in Martinsburg, West Virginia. The airport, a county-owned facility 4 miles south of the city of Martinsburg, has been used by the Air National Guard (ANG) since 1958. Over the years, the types of military aircraft based and serviced there have varied, due to the change in mission of the 167th TAG. Both past and present operations have involved the use and disposal of hazardous materials. Because of the use and disposal of hazardous materials the ANG has implemented its Installation Restoration Program (IRP). The IRP is a four phase program as follows:

Phase I - Records Search (Installation Assessment) to identify and prioritize past disposal sites posing a potential and/or actual hazard to public health or the environment.

Phase II/IVA - Site Characterization/Remedial Action Plan to define and quantify the presence or absence of contamination that may have an adverse impact on public health or the environment via field studies, and to develop a remedial action plan (RAP).

Phase III - Technology Base Development (if needed) to develop new technology for accomplishment of remediation.

Phase IVB - Remedial Action.

This study effort is limited to Phase I activities.

B. Purpose

The purpose of this program is to search for, identify, and assess actual or potential contaminant migration at Shepherd Field ANGB by reviewing available records and interviewing current employees who have a knowledge of present and past operations.

C. Scope

The scope of this records search is limited primarily to the ANG property of the 167th TAG based at the Eastern West Virginia Regional Airport. Thus far, the following actions have been taken:

- o Onsite base visit,
- o Meeting with and interviewing personnel from the 167th TAG
- o Review and analysis of all information obtained, and
- o Preparation of recommendations for further action.

The onsite visit took place August 19, 1985. The following personnel were assigned to the team and provided input to this report:

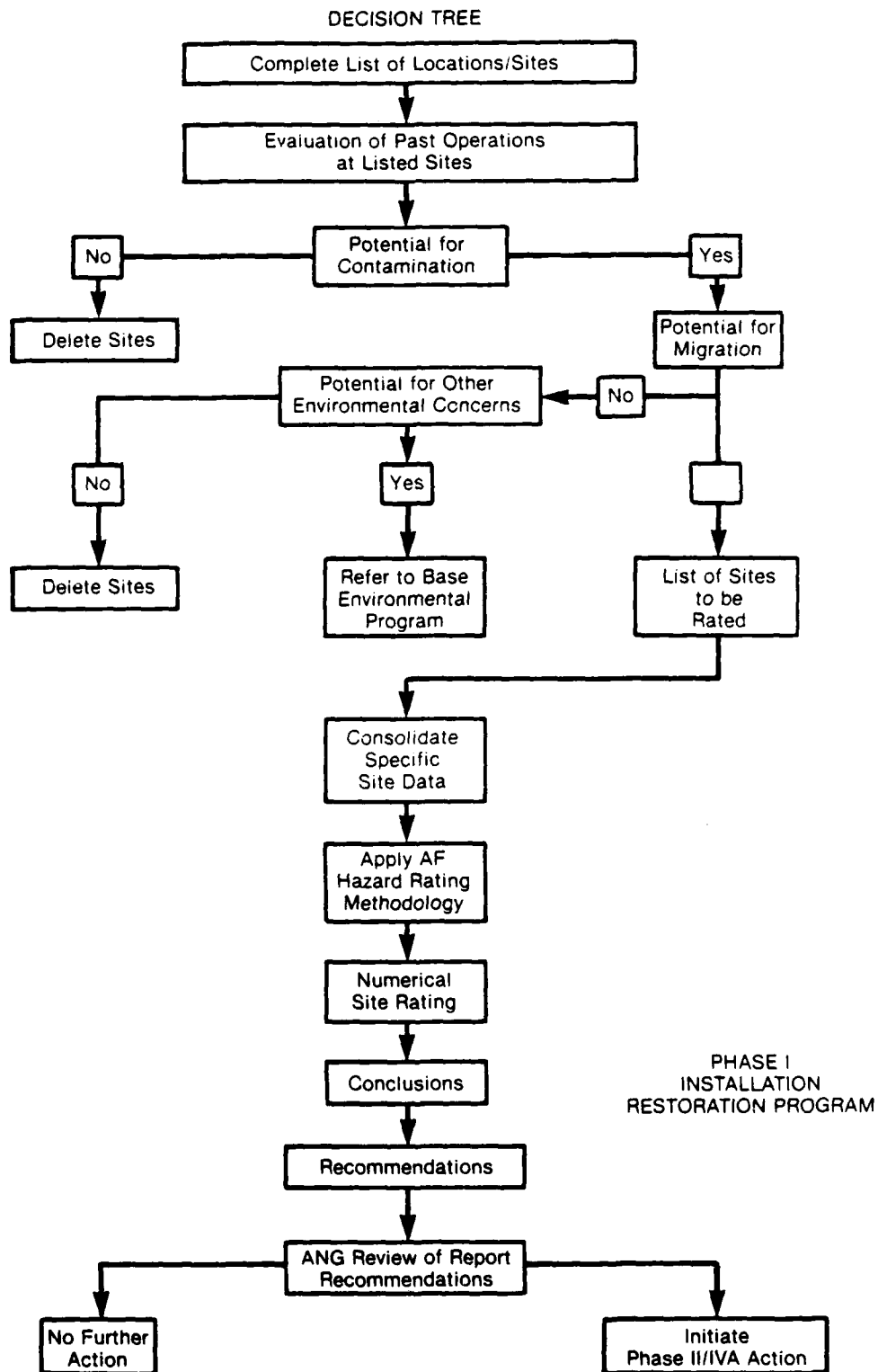
Mr. William Eaton, Hydrogeologist
Mr. Timothy Gardner, Environmental Biologist
Ms. Shari Samuels, Safety Specialist
Mr. Larry Greenfeld, Environmental Scientist

Resumes of the team members appear in Appendix E.

Individuals from the ANG who assisted in the records search include Mr. Art Lee, Environmental Engineer, ANGSC/DEV, and selected members of the 167th TAG. The point of contact at Shepherd Field ANGB was Major William Burkhart, Base Civil Engineer.

D. Methodology

Figure 1 is a flowchart of the records search methodology. The team identified three locations at Shepherd Field ANGB where hazardous materials were used or disposed of within the bounds of the ANG property. A fourth site, the Fire Training Area (FTA), was also identified. Although the FTA is not located on ANG property, the Air National Guard Support Center (ANGSC) has determined that it should be included in this study since the 167th TAG is the sole user. The 167th TAG is currently in the process of procuring this site from the Eastern West Virginia State Airport.



The team evaluated past and present operating procedures at the identified hazardous waste disposal/spill sites to determine whether environmental contamination may have occurred. This evaluation was facilitated by extensive interviews with six base employees familiar with the various operating areas of the base. Appendix A lists their principal areas of knowledge and their years of experience at the installation.

Base blueprints and records were reviewed to supplement information obtained from the interviews. In addition, the team toured the identified sites to determine the presence of visible contamination and to assess the potential for contaminant migration. Particular attention was given to locating nearby drainage ditches or surface water bodies. After compiling the necessary environmental information, three of the four identified sites were numerically rated using the Air Force Hazard Assessment Rating Methodology (HARM).

II. INSTALLATION DESCRIPTION

A. Location

The 167th TAG is located on Shepherd Field ANGB at the Eastern West Virginia Regional Airport, approximately 4 miles south of the city of Martinsburg, West Virginia, adjacent to U.S. Highway 11.

The base, which is situated 556 feet above sea level, is comprised of approximately 346 acres designated for exclusive use by the ANG. The runways are used jointly with the airport. Figure 2 shows the area studied for this Phase I report.

B. Organization and History

The installation, called Shepherd Field, was first used in 1922 by several Martinsburg citizens. During 1927 and 1928, the Maryland National Guard flying units used the field for flying encampments.

On October 4, 1958, the 167th Fighter Interceptor Squadron dedicated its new ANG facility at the site. From 1958 to the present, various types of military aircraft have been based with the 167th, the mission having changed with each type of aircraft. These aircraft have included F-86s, T-33s, C-119s and C-121s. Currently, eight C-130 aircraft are assigned to the 167th, and an additional five C-130s are scheduled for assignment in the fall of 1986.

III. ENVIRONMENTAL SETTING

A. Meteorology

Precipitation in Martinsburg, West Virginia, averages 36.44 inches annually. By calculating net precipitation according to the method outlined in the Federal Register (47 FR 31224, July 16, 1982), a net precipitation value of 4.44 inches per year is obtained. Rainfall intensity based on 1-year, 24-hour rainfall is 2.5 inches (calculated according to 47 FR 31235, July 16, 1982, Figure 8).

B. Geology

Berkeley County, West Virginia, is located in the ridge and valley province of the Appalachian Mountains. The geology of Berkeley County is typical of this region, consisting of eroded limestones, shales and sandstones formed during the mountain building episode of the late Paleozoic period, approximately 300 million years ago.

On a more local scale, few reports are available that describe the geologic setting in the immediate vicinity of Shepherd Field ANGB. Boreholes taken in the area where the new extended concrete parking apron is to be constructed suggest that the limestone bedrock is encountered at a depth of about 10 feet; however, limestone pinnacles may extend to the surface at isolated locations. The logs of onbase groundwater wells that could provide useful information are absent.

Most of the bedrock that immediately underlies Shepherd Field ANGB is fractured and faulted limestone. A fault line running north/south bisects the base east of the control tower. Shale bedrock also underlies portions of the base, as in the vicinity of the fire department training area.

The Shepherd Field ANGB straddles two major soil associations of the Great Valley: the Frederick-Hagerstown-Murrill association to the west and the Chilhowie-Carbo-Hagerstown association to the east. These soils have developed from the limestone formations underlying the Great Valley. Six soil types have been identified within installation boundaries. Figure 3 shows locations of the soil types at the base and Table 1 describes their properties.

C. Hydrology

1. Surface Water

The Shepherd Field ANGB is not within the boundaries of a flood-plain associated with 100-year frequency floods. Drainage is well developed in the areas surrounding the base. Surface waters from the base eventually find their way into the Potomac River to the northeast via small runs and branches located near airport boundaries. Generally, surface water from the northern half of the Shepherd Field ANGB flows northward into Cold Spring Run, and surface water from the southern half flows eastward into Opequon Creek. Neither of these Potomac River tributaries is used as a source of drinking water.

2. Groundwater

The primary waterbearing stratum in the Martinsburg area is the Beekmantown Limestone. Wells screened in this formation are generally in the 200-foot range. Areas of recharge for this aquifer are the fractures, fault zones and cavernous areas commonly found in Berkeley County. However, there are no cavernous features such as sinkholes within the base boundaries. The fault described earlier in this section is an area of interest because water tends to flow along permeable faults, often in places where these features lie nearly parallel to the water table contours.

Figure 3.
Map of Soils in the Vicinity of Shepherd Field ANGB.

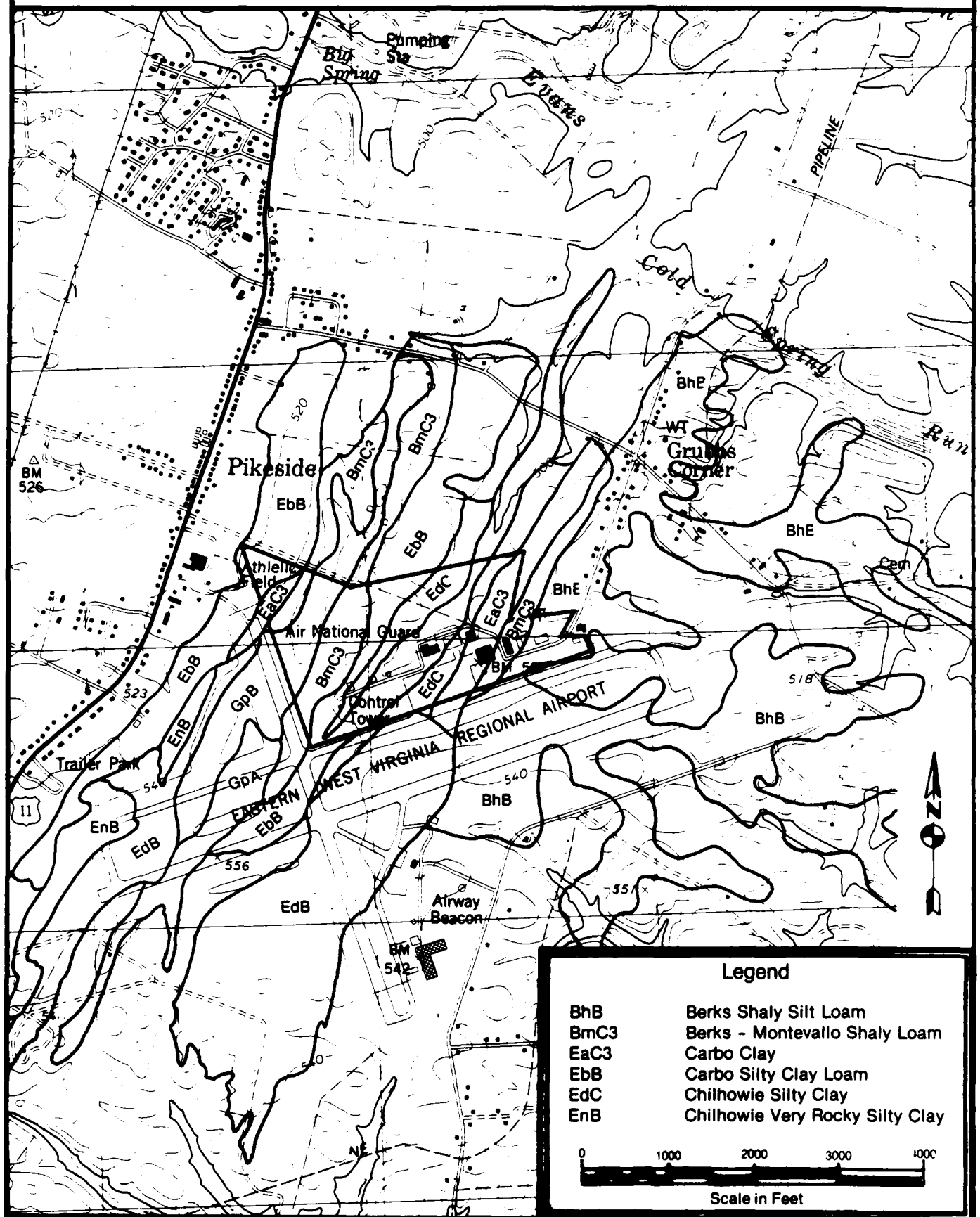


Table 1. Description of Soils at Shepherd Field ANGB

Map Symbol	Unit Description	Brief Description of Site and Soil	Depth From Surface (Typical Profile, Inches)	Permeability (cm/sec)
BhB	Berks shaly silt loam, 3% to 8% slopes	About 1/2 foot of shaly silt loam over 1 to 1-1/2 feet shaly silt loam; 35% to 75% soft shale fragments 1 to 3 inches across; over strongly folded, soft silty shale; on rolling shale belts in limestone valley.	0-7 7-21	4.4×10^{-3}
EbB	Carbo silty clay loam, 2% to 8% slopes	About 1 foot of silty clay loam, over 2 to 3 feet of plastic sticky clay, underlain by massive limestone with irregular surface; a few limestone outcrops; on smooth uplands in limestone valley.	0-8 8-36	$4.4 \times 10^{-4} - 1.4 \times 10^{-3}$
EaC3	Carbo clay, 8% to 15% slopes	Similar to above profile except that the surface layer has been removed through erosion.		$1.4 \times 10^{-4} - 4.4 \times 10^{-4}$
EdB	Chilhowie silty clay, 2% to 8% slopes	1/2 to 1 foot of silty clay over 1 to 1-1/2 feet of plastic, sticky clay, underlain by limestone that is somewhat broken and blocky on top; very rocky soils have numerous outcrops of limestone; occupy mostly gentle slopes in limestone valley.	0-6 6-25	$1.4 \times 10^{-4} - 4.4 \times 10^{-4}$
EdC	Chilhowie silty clay, 8% to 15% slopes	Same as above except EdC has stronger slopes and a higher erosion factor.		$1.4 \times 10^{-4} - 4.4 \times 10^{-4}$
EnB	Chilhowie very rocky silty clay, 3% to 8% slopes	Same as Chilhowie silty clay except EnB has loose fragments of limestone		$1.4 \times 10^{-4} - 4.4 \times 10^{-4}$

Using the Ground-Water Hydrology Map of Berkeley County, West Virginia (Hobba, 1976), it is possible to estimate the water table depth at a site by observing the difference between a local land surface elevation contour and the water table elevation contour given in the above report. Based on this method, it is estimated that the groundwater table depths at Shepherd Field ANGB range from 25 to 40 feet. However, annual groundwater fluctuation has been as much as 32 feet in the Martinsburg area (Hobba, 1976). By assuming that the hydraulic gradient is closely related to topography for a water table aquifer and observing the water table contours and mapped faults and fractures, the groundwater flow direction is estimated to be toward the north for the area north of the east-west runway. All of the hazardous waste disposal/spill sites subsequently identified in this report are located to the north of the east-west runway. Groundwater in the area south of the east-west runway generally flows eastward toward the Opequon Creek, which is located about 1 mile east of the Shepherd Field ANGB.

IV. FINDINGS

A. Activity Review

Base records and interviews with base personnel indicate that the activities which use and dispose of the majority of industrial chemicals and resultant hazardous wastes are aircraft maintenance, aerospace ground equipment (AGE) maintenance, ground vehicle maintenance, and fire department training. A brief description of these activities and best estimates of the quantities of wastes generated by each are provided in the following sections.

1. Aircraft Maintenance/AGE Maintenance

These activities are discussed together since they are performed in the same building, and the wastes generated by them are comingled for storage and disposal. The wastes generated by these operations routinely consist of used engine oil, hydraulic oil, cleaning solvents, battery acid, paints, thinners, and stripping compounds.

Engine oil was hauled off base by a private contractor for disposal up until 1980. Since that time it has been disposed of through the Defense Reutilization and Marketing Office (DRMO), and hauled by private contractors. It is estimated that the shops generate 400 gallons per year of waste engine oil. Hydraulic oil has been disposed of in the same manner as the engine oil, and the volume is estimated to be 350 gallons per year since 1972. Before 1972 the shops generated approximately 500 gallons per year. No waste oils have ever been used for road dust control at Shepherd Field ANGB.

Stripping compounds, cleaners, and solvents are used to clean and prepare aircraft and other mechanical parts for inspections to determine the presence of cracks and other structural faults and weaknesses. These materials are disposed of via DRMO, and it is estimated that no more than 600 gallons per year are used and disposed of by these activities.

Battery acid has always been disposed of by being neutralized and drained into the sanitary sewer. It is estimated that less than 10 gallons of acid per year is generated at these shops.

Paints and thinners are routinely used for corrosion control activities, and the waste products are drummed and disposed of through DRMO. Quantities of these wastes vary, but it is estimated that less than 300 gallons of paint and thinners are used and disposed of per year.

2. Ground Vehicle Maintenance

Ground vehicle maintenance is performed in the motor pool shop. Hazardous wastes produced here include waste engine oil, solvents, cleaners, and battery acid.

As with the aircraft and AGE maintenance activities, the waste engine oil is hauled off base for disposal. It has always been hauled by private contractors, and since 1980 it has been disposed of through DRMO. It is estimated that no more than 200 gallons of engine oil per year is shipped out of the ground vehicle maintenance shop.

Solvents and cleaners are also shipped offbase through DRMO, and it is estimated that no more than 50 gallons per year is generated from the motor pool. Battery acid has always been neutralized and disposed of in the sanitary sewer at Shepherd Field. No more than 10 gallons per year is generated at the motor pool.

3. Fire Department Training

The Fire Training Area (FTA) at Shepherd Field consists of an open gravel-bottomed pit where flammable liquids are dumped and ignited for training purposes. The pit has been operational since about 1960. From 1960 until about 1975, the training exercises occurred about once a month, and each episode involved the use of about 200 to 250 gallons of AVGAS and/or JP-4.

After 1975 and until the present, each training episode involved about 300 to 350 gallons of JP-4 at a frequency of one exercise per month. During the earlier years, some waste shop solvents were disposed of in the pit, but that practice was discontinued about 10 years ago.

B. Disposal/Spill Identification, Evaluation, and Hazard Assessment

Interviews with six base personnel (Appendix A) and subsequent site inspections resulted in the identification of four disposal/spill sites. It was determined that three of the four sites (Sites Nos. 1, 3, and 4) have the potential for contaminant migration (Step 4 of Figure 1), and therefore they were further evaluated and rated using HARM (Appendix B). Figure 4 illustrates the locations of the rated/unrated sites. Soil at Site No. 2 was sampled by the base bioenvironmental engineering technician, and was not found to be contaminated by hazardous wastes. Additionally, a site inspection revealed very limited environmental stress. Therefore, the site was deleted from the HARM rating process (Step 3 of Figure 1). Copies of the completed HARM rating forms are found in Appendix C. Table 2 summarizes the HARM scores for each of the rated sites. Brief descriptions of the rated/unrated sites follow.

Site No. 1 - Drainage Ditch Next to Motor Pool (HARM Score: 41)

The drainage ditch is located next to a paved area at the motor pool and serves as a receptor for runoff from this area. During the interviews, it was learned that routine washdown residues and engine oil drippings have been washed into the ditch during episodes of precipitation. It would be very difficult to quantify the amount of contaminants that have entered the ditch over the years; however, based on the interviews, estimates are no more than 10 gallons per month of Petroleum, Oils, and Lubricants (POL) products.

Visual inspection of the site revealed a very small amount of discolored soil within a few inches of the paved area next to the motor pool, just above the ditch. No vegetative stress was observed, but because of the uncertain extent of past contamination, it was determined that a HARM assessment should be made for this site.

Figure 4.
Locations of Rated/Unrated Waste Disposal and Spill Sites at Shepherd Field ANGB.

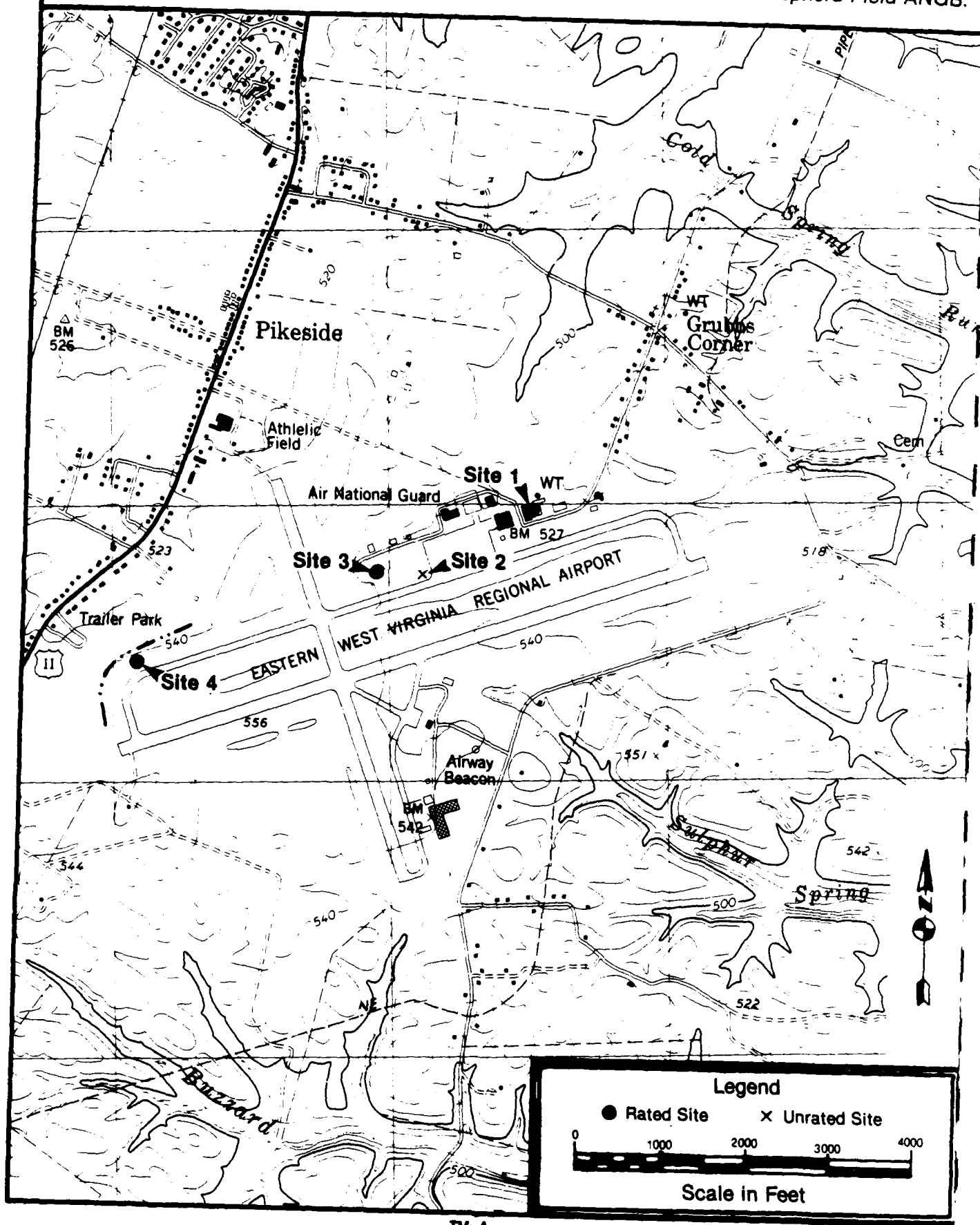


Table 2. Summary of the Results of the Site HARM Ratings

Site Priority	No.	Site Description	Receptors	Subscores			Overall Score
				Waste Character- istics	Pathway	Waste Mgmt. Practices	
1	4	Fire Training Area	48	80	48	1.0	59
2	3	Shipping/Receiving	52	60	54	1.0	55
3	1	Drainage Ditch Next to Motor Pool	52	24	47	1.0	41

Site No. 2 - Temporary Hazardous Waste Storage Area (Unrated)

This site is located north of the main taxiway, adjacent to the aircraft parking apron. It consists of a concrete slab approximately 20 feet by 20 feet, with no structural containment, i.e., walls, dikes, or roof. Waste solvents, strippers, and POL products are stored in 55-gallon drums on the slab prior to being moved to the shipping/receiving area (Site No. 3) for transport and ultimate disposal. Seepage from the drums has occurred from time to time, but no major spills have been reported. Visual inspection of the site revealed some discolored concrete and a small area of discolored soil next to the slab. Soil samples taken by the base bioenvironmental engineering technician were negative for the presence of any hazardous wastes. (The soil samples were analyzed for volatile halocarbons and volatile organics utilizing EPA Methods 8010 and 8020.)

The lack of any positive presence of hazardous waste and the absence of data indicating anything other than minor spills of waste materials resulted in a finding of No Significant Impact, the conclusion that HARM assessment was unnecessary, and the decision by Air National Guard Support Center officials that the site be eliminated from any future studies.

Site No. 3 - Shipping/Receiving Area (HARM Score: 55)

This site is west of the aircraft parking apron and is in an open field. It consists of an open area (approximately one-quarter acre) that has been graded and graveled. No containment structures exist, i.e., walls, dikes, or roof. Solvents, strippers, and some POL products are stored here prior to distribution, and hazardous waste products are staged here prior to shipment for disposal. Interviews and a site inspection confirmed that a spill had occurred near the hazardous waste staging area. The base bioenvironmental engineering technician performed some soil sampling at the spill site, and the presence of tetrachloroethylene and ethyl benzene was confirmed (Appendix D). Environmental stress was visually absent except for some soil discoloration where the spill occurred. Since the ground is graveled, it

could not be accurately ascertained whether significant spills had occurred at other locations on the site. The site drains directly into a ditch approximately 100 yards to the east. Confirmation of the spill and the presence of discolored soil indicate the need for a HARM rating.

Wastes that have been stored at Sites Nos. 2 and 3 include the following:

Trichloroethylene	Antifreeze (Ethylene Glycol)
Tetrachloroethylene	Thinner (MEK with Polyurethane Paint)
JP-4 (Jet Fuel)	Isopropyl Alcohol
115/145 AVGAS	Paint Stripper (B&B 7218P)
Fl40 Solvent (Stoddard)	Paint Stripper (Ammonia based)
El Dorado Cold Stripper	Cold Stripper (Methylene chloride)
Engine Oil (140 grade)	Solvent (PS-661)
Hydraulic Fluid (MIL-H-5606)	Solvent (PD-680)

Site No. 4 - Fire Training Area (FTA) (HARM Score: 59)

This site is located just north of the west end of the main taxiway. It is not within the ANG property of Shepherd Field ANGB; however, it is being considered in the IRP Records Search because the ANG has been the sole user of this site, and as such, holds ultimate responsibility for any hazardous waste found there. Additionally, it is anticipated that the ANG will soon have the fire training area formally added to their property lease. The site consists of an open gravel-bottomed pit where flammable liquids are dumped and ignited for training purposes. The pit has been operational since about 1960. From 1960 until about 1975, the training exercises occurred about once a month, and each episode involved the use of about 200 to 250 gallons of AVGAS and/or JP-4. After 1975 and until the present, each training episode involved about 300 to 350 gallons of JP-4 at a frequency of one exercise/month. During the earlier years, some waste shop solvents were disposed of in the pit, but that practice was discontinued about 10 years ago.

There are no containment structures at the site, and in fact, one end of the pit is sufficiently low to allow runoff to enter the drainage ditch, which leads to Cold Spring Run, during heavy precipitation. Also,

there is a stand pipe in the pit designed to channel overflow directly into the above-mentioned drainage ditch.

During the site observation, free-standing water was noted in the pit as a result of precipitation. Discolored soil was prevalent and an odor of POL products was quite noticeable. The large quantity of wastes disposed of at this site and its proximity to the drainage ditch made it obvious that a HARM evaluation was in order.

V. CONCLUSIONS

- o Information obtained through interviews with six base personnel, review of base records, and field observations have resulted in the identification of four disposal and/or spill sites at the Shepherd Field ANGB.
- o Three of the four sites have been further evaluated using the Air Force's HARM. A priority list of these waste disposal and spill sites and their associated HARM scores has been presented in Table 2. No sites exhibit any major visible environmental stress.
- o One site (Site No. 2) was eliminated from further study due to analytically confirmed absence of hazardous wastes.
- o Evidence of shallow soil contamination at one site (Site No. 3) was discovered prior to the Phase I study via sampling conducted by the base bioenvironmental engineering technician.
- o The overall groundwater environment at Shepherd Field ANGB is susceptible to surface contamination due to the presence of relatively permeable soils and shallow carbonate bedrock, which is likely to be fractured.
- o Groundwater use in the Shepherd Field ANGB area is minimal due to the availability of municipal supplies.
- o No evidence of offbase environmental stress from past waste material disposal was observed in the immediate vicinity of the Shepherd Field ANGB.

VI. RECOMMENDATIONS

There is potential for contaminant migration at Shepherd Field ANGB; therefore, initial stages of the Phase II/IV-A IRP are recommended. This program should consist of analysis of soil and groundwater samples for the various parameters within the site-specific recommendations below. The primary purposes for monitoring each of the proposed locations are:

- o To determine which pollutants are present at each site or to determine that no pollutants are present; and
- o To determine whether groundwater at each site has been contaminated, and if it has, to give quantification with respect to contaminant concentrations, the boundary of the contaminant plume, and the rate of migration.

A. Locations To Be Investigated

Three of the four sites are recommended for the Phase II/IV-A program. Figures 5A and 5B illustrate the recommended locations for the collection of soil, water, and sediment samples.

B. Site-Specific Sampling and Analysis Recommendations

Site No. 1 (Motor Pool Drainage Ditch)

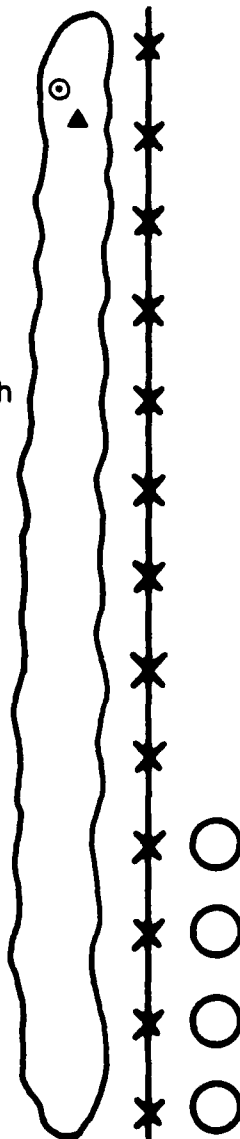
Site No. 1 encompasses the motor pool drainage ditch. One shallow monitoring well is recommended at this site as illustrated in Figure 5A. During the site survey walk-through, the only evidence of contamination that was observed was a very small amount of discolored soil above the ditch and next to the motor pool parking lot. Since any contamination from this source would wash into the ditch, it is recommended that groundwater sampling be conducted downgradient of the motor pool drainage ditch to see if any contaminants have reached the groundwater in that area. Groundwater should be analyzed for volatile organic carbon species, oil and grease, total organic halogens, and phenols. In addition to checking the groundwater, it is recommended that soil from the boring should be sampled. Also, one shallow subsurface sediment sample should be taken, since this area represents a natural collection spot for surface-derived contamination.

Figure 5A.
Locations of the Proposed Soil and Groundwater Samples
to be Collected at Rated Site No. 1.

Site 1

Road

Motor Pool Ditch

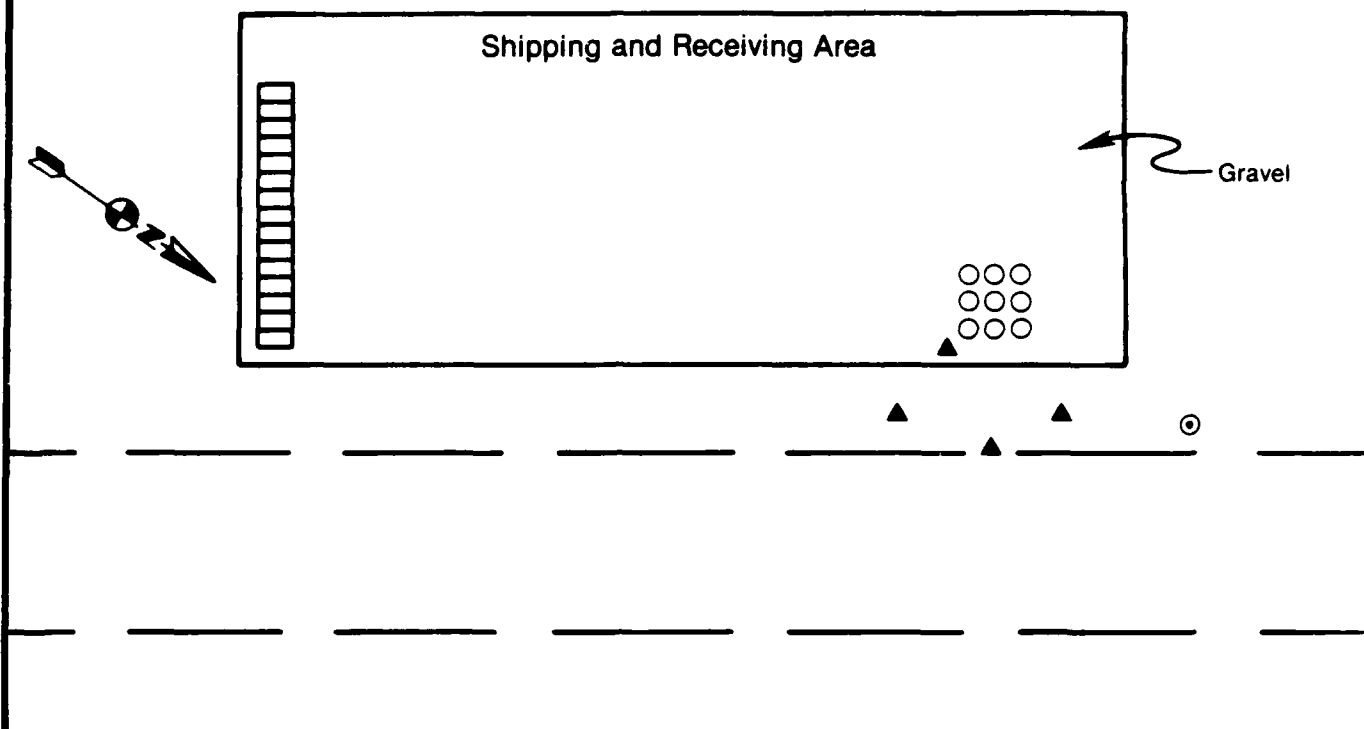


- ⊙ Monitoring Well
- ▲ Soil Sample

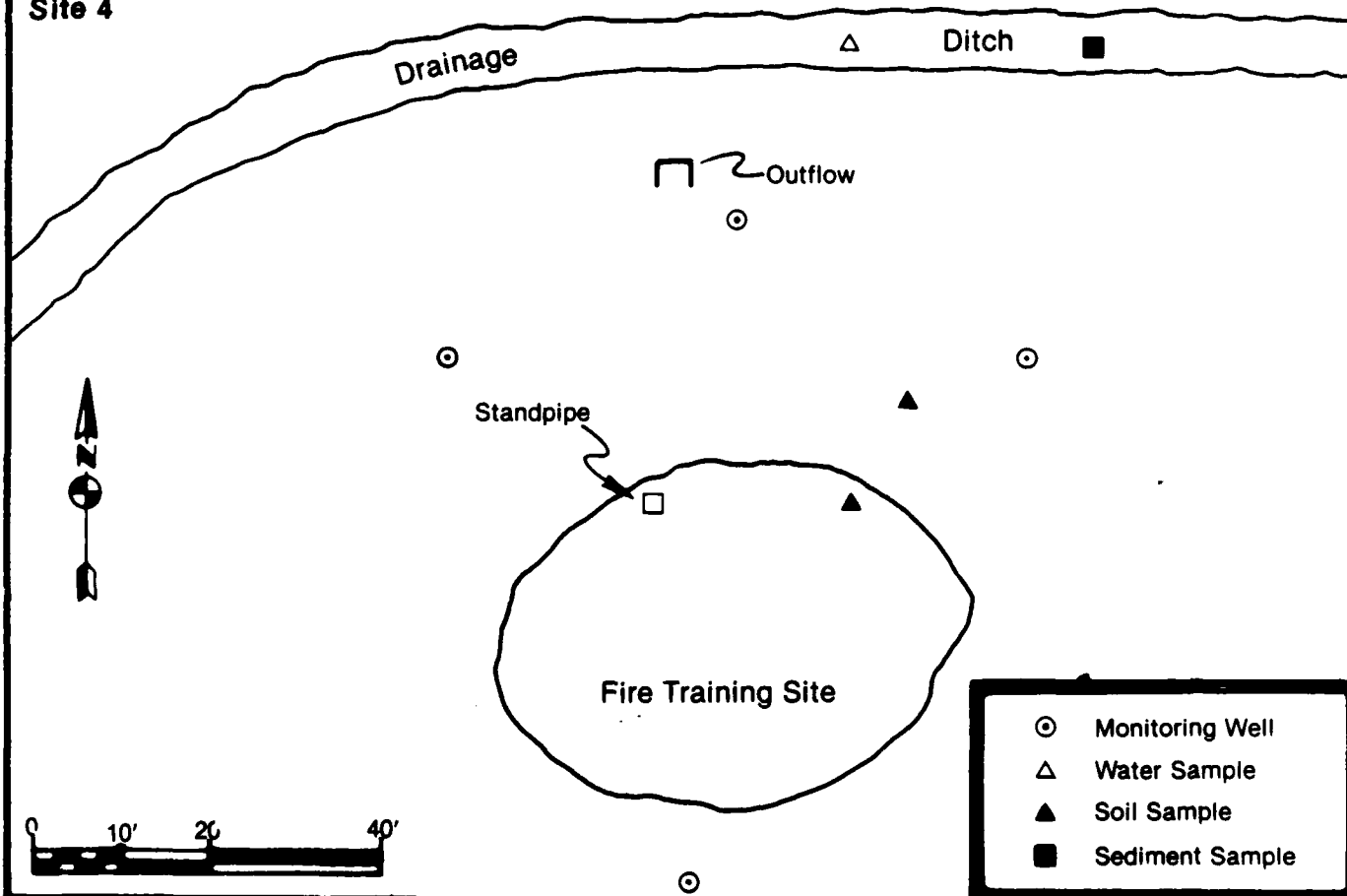
Figure 5B.

Locations of the Proposed Soil and Groundwater Samples to be Collected at Rated Sites Nos. 3 and 4.

Site 3



Site 4



VI-3

Site No. 3 (Shipping and Receiving Area)

This site encompasses the shipping and receiving area. A minor spill was confirmed at this site and subsequent soil sampling verified contamination. This minor spill has been cleaned up, but four surface soil samples should be taken topographically downgradient from the area to verify completion of the cleanup. In addition, one shallow monitoring well is recommended hydrogeologically downgradient of the spill site. Groundwater should be analyzed for volatile organic carbon species, oil and grease, total organic halogens, phenols, and heavy metals. If the water sample is positive, more extensive sampling may be necessary to fully characterize the extent of contamination.

Site No. 4 (Fire Training Area)

Included at this site are the fire training pit and the ditch that drains the area. One surface soil sample should be collected from the fire pit in order to accurately characterize the type of contaminants present. A water sample and a sediment sample should be collected from the drainage ditch. These should be analyzed to determine whether or not the contaminants have reached the ditch. Three shallow monitoring wells are recommended between the pit and the ditch, and one upgradient from the pit. Analysis of the well water will help determine how extensively the training exercises have affected the local water table aquifer. Groundwater should be analyzed for volatile organic carbon species, oil and grease, total organic halogens, and phenols. Also, two soil samples should be taken from the monitoring wells. The first soil sample should be from the very shallow subsurface; the other from the interface between the soil and the underlying bedrock.

If the results of sampling and analysis confirm the presence of groundwater contamination at any disposal/spill sites underlain by limestone bedrock (Site nos. 1 and 3), low altitude aerial photographs of these sites should be reviewed to determine the presence of fracture traces. Fracture traces observed on aerial photographs often represent the surface expression of fracture and fault zones within the bedrock. In carbonate bedrock, these fracture zones represent preferential pathways for migration of groundwater and groundwater contaminants. If fracture traces are observed to intersect sites with confirmed groundwater contamination, it would be highly advisable to install additional groundwater monitoring along the fracture zone to fully assess the potential for contaminant migration.

GLOSSARY OF TERMS

1. **AQUIFER** - A geologic formation, or group of formations, that contains sufficient saturated permeable material to conduct groundwater and to yield economically significant quantities of groundwater to wells and springs.
2. **CONTAMINANT** - As defined by section 104(a)(2) CERCLA, shall include, but not be limited to, any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will cause or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction) or physical deformation in such organisms or their offspring.
3. **DISCHARGE** - The process involved in the draining or seepage of water out of a groundwater aquifer.
4. **DOWNGRAIENT** - A direction that is hydraulically downslope; the direction in which groundwater flows.
5. **HAZARDOUS WASTE** - A solid or liquid waste that, because of its quantity, concentration, or physical, chemical, or infectious characteristics may:
 - a. Cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible or incapacitating reversible illness; or
 - b. Pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of, or otherwise managed.

6. **MIGRATION (Contaminant)** - The movement of contaminants through pathways (groundwater, surface water, soil, and air).
7. **PERMEABILITY** - The capacity of a porous rock, sediment, or soil for transmitting a fluid without impairment of the structure of the medium; it is a measure of the relative ease of fluid flow under unequal pressure.
8. **STRATA** - Distinguishable horizontal layers separated vertically from other layers.
9. **SURFACE WATER** - All water exposed at the ground surface, including streams, rivers, ponds, and lakes.
10. **UPGRADIENT** - A direction that is hydraulically upslope.
11. **WATER TABLE** - The upper limit of the portion of the ground that is wholly saturated with water.

REFERENCES

1. Hobba, W.A., Groundwater Hydrology of Berkeley County, West Virginia, prepared by the U.S. Geological Survey, 21 pp., 1976.
2. Gorman, J.L., Pasto, J.K., and Crocker, C.D., Soil Survey of Berkeley County, West Virginia, United States Department of Agriculture, U.S. Government Printing Office, 141 pp., 1966.
3. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map of Berkeley County, West Virginia, December 16, 1977.

Appendix A

Interviewee Information

INTERVIEWEE INFORMATION

<u>Interviewee Number</u>	<u>Primary Duty Assignment</u>	<u>Years Associated With Shepherd Field ANGB</u>
1	Fire Department Personnel	27
2	Aircraft Maintenance Personnel	28
3	Motor Pool Personnel	24
4	Aircraft Maintenance Personnel	29
5	Aircraft Maintenance Personnel	28
6	Aircraft Maintenance Personnel	29

Appendix B
USAF Hazard Assessment
Rating Methodology

USAF HAZARD ASSESSMENT RATING METHODOLOGY

The Department of Defense (DOD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DOD facilities. One of the actions required under this program is to:

develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts. (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Records Search phase of its Installation Restoration Program (IRP).

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the National Guard in setting priorities for follow-on site investigations.

This rating system is used only after it has been determined that: (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DOD program needs.

The model uses data readily obtained during the Record Search portion (Phase I) of the IRP. Scoring judgments and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards at the site. This approach meshes well with the policy for evaluating and setting restrictions on excess DOD properties.

Site scores are developed using the appropriate ranking factors according to the method presented in the flow chart (Figure 1 of this report). The site rating form and the rating factor guideline are provided at the end of this appendix.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: The possible receptors of the contamination, the waste and its characteristics, the potential pathways for contamination migration, and any efforts that were made to contain the wastes resulting from a spill.

The receptors category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned, and for direct evidence, 100 points are assigned. If no evidence is found, the highest score among three possible routes is used. These routes are surface-water migration, flooding, and groundwater migration. Evaluation of each route involves factors associated with the particular migration route. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the

waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The scores for each of the three categories are then added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Scores for sites at which there is not containment are not reduced. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.

HAZARDOUS ASSESSMENT RATING FORM

Page 1 of 2

NAME OF SITE _____

LOCATION _____

DATE OF OPERATION OR OCCURRENCE _____

OWNER/OPERATOR _____

COMMENTS/DESCRIPTION _____

SITE RATED BY _____

1. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site		4		
B. Distance to nearest well		10		
C. Land use/zoning within 1 mile radius		3		
D. Distance to installation boundary		6		
E. Critical environments within 1 mile radius of site		10		
F. Water quality of nearest surface water body		6		
G. Ground water use of uppermost aquifer		9		
H. Population served by surface water supply within 3 miles downstream of site		6		
I. Population served by ground-water supply within 3 miles of site		6		

Subtotals _____

Receptors subscore (100 X factor score subtotal/maximum score subtotal) _____

11. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) _____
2. Confidence level (C - confirmed, S - suspected) _____
3. Hazard rating (H - high, M - medium, L - low) _____

Factor Subscore A (from 20 to 100 based on factor score matrix) _____

B. Apply persistence factor

Factor Subscore A X Persistence Factor = Subscore B

_____ X _____ = _____

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

_____ X _____ = _____

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 30 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
				Subscore _____
B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface water migration				
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		
			Subtotals	_____
Subscore (100 X factor score subtotal/maximum score subtotal)				_____
2. Flooding				
		1		
Subscore (100 X factor score/3)				_____
3. Ground water migration				
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		
			Subtotals	_____
Subscore (100 X factor score subtotal/maximum score subtotal)				_____
C. Highest pathway subscore.				
Enter the highest subscore value from A, B-1, B-2 or B-3 above.				
			Pathways Subscore	_____

IV. WASTE MANAGEMENT PRACTICES

- A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	_____
Waste Characteristics	_____
Pathways	_____

Total _____ divided by 3 = _____

Gross Total Score

- B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

_____ X _____ =

Table 1
HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES

1. RECEPTORS CATEGORY	Rating Scale Levels				Multiplier
	0	1	2	3	
Rating Factors					
A. Population within 1,000 feet (includes on-base facilities)	0	1-25	26-100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1-mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or Industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1-mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands	10
F. Water quality/use designation of nearest surface water body	Agricultural or Industrial use	Recreation, propagation and management of fish and wildlife	Shellfish propagation and harvesting	Potable water supplies	6
G. Ground-water use of uppermost aquifer	Not used, other sources readily available	Commercial, Industrial, or irrigation, very limited other water sources	Drinking water, municipal water available	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1-15	51-1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1-50	51-1,000	Greater than 1,000	6

Table 1--Continued

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

- S - Small quantity (5 tons or 20 drums of liquid)
- M - Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
- L - Large quantity (20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C - Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records
- o Knowledge of types and quantities of wastes generated by shops and other areas on base

S - Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records
- o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site

A-3 Hazard Rating

Rating Factors	Rating Scale Levels		
	0	1	2
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels
Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.			
Hazard Rating			Points
High (H)			3
Medium (M)			2
Low (L)			1

Table 1--Continued

II. WASTE CHARACTERISTICS--Continued

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	H
70	H	C	H
60	L	S	H
60	S	C	H
60	H	C	H
50	L	S	H
50	L	C	L
50	H	S	H
50	S	C	H
40	S	S	H
40	H	S	H
40	H	C	L
30	L	S	L
30	S	C	L
30	H	S	L
20	S	S	H
20	S	S	L

B. Persistence Multiplier for Point Rating

Multiply Point Rating Persistence Criteria	From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Part A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

Notes:

For a site with more than one hazardous waste, the waste quantities may be added using the following rules:

- o Confirmed confidence level (C) can be added.
- o Suspected confidence level (S) can be added.
- o Confirmed confidence level cannot be added with suspected confidence level.

Waste Hazard Rating

- o Wastes with the same hazard rating can be added.
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., HCH + SCH = LCH if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an HCH designation (60 points). By adding the quantities of each waste, the designation may change to LCH (80 points). In this case, the correct point rating for the waste is 80.

Table 1--Continued

111. PATHWAYS CATEGORYA. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 Potential for Surface Water Contamination

Rating Factors	Rating Scale Levels			Multiplier	
	0	1	2		
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	0
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay (>10 ⁻² cm/sec)	15% to 30% clay (10 ⁻² to 10 ⁻⁴ cm/sec)	30% to 50% clay (10 ⁻⁴ to 10 ⁻⁶ cm/sec)	Greater than 50% clay (>10 ⁻⁶ cm/sec)	6
Rainfall intensity based on 1-year 24-hour rainfall (Thunderstorms)	<1.0 inch 0-5 0	1.0 to 2.0 inches 6-35 30	2.1 to 3.0 inches 36-49 60	>3.0 inches >50 100	8

B-2 Potential for Flooding

Floodplain	Beyond 100-year floodplain	In 100-year floodplain	In 10-year floodplain	Floods annually	1
------------	----------------------------	------------------------	-----------------------	-----------------	---

B-3 Potential for Ground-Water Contamination

Depth to ground water	Greater than 500 feet	50 to 500 feet	11 to 50 feet	0 to 10 feet	0
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Soil permeability	Greater than 50% clay (>10 ⁻⁶ cm/sec)	30% to 50% clay (10 ⁻⁴ to 10 ⁻⁶ cm/sec)	15% to 30% clay (10 ⁻² to 10 ⁻⁴ cm/sec)	0% to 15% clay (<10 ⁻² cm/sec)	8

Table 1--Continued

B-3 Potential for Ground-Water Contamination--Continued

Rating Factors	Rating Scale Levels			Multiplier
	0	1	2	
Subsurface flows	Bottom of site greater than 5 ft. above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located located below mean ground-water level
Direct access to ground water (through faults, fractures, faulty well casings, subsidence, fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subcores.

B. Waste Management Practices Factor

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Fire Protection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1, or III-6-3, then leave blank for calculation of factor score and maximum possible score.

CNR122

Appendix C
Site Harm Rating Forms

HAZARDOUS ASSESSMENT RATING FORM

Page 1 of 2

NAME OF SITE Site No. 1 - Drainage Ditch Next to Motor PoolLOCATION Adjacent to Motor PoolDATE OF OPERATION OR OCCURRENCE 1982-1985OWNER/OPERATOR West Virginia Air National Guard

COMMENTS/DESCRIPTION _____

SITE RATED BY Hazardous Materials Technical Center

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 1 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 1 miles of site	1	6	6	18

Subtotals 94 180Receptors subscore (100 X factor score subtotal/maximum score subtotal) 52

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S2. Confidence level (C = confirmed, S = suspected) C3. Hazard rating (H = high, M = medium, L = low) L30

Factor Subscore A (from 20 to 100 based on factor score matrix)

B. Apply persistence factor

Factor Subscore A X Persistence Factor = Subscore B

30 x 0.8 = 24

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

24 x 1.0 = 24

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 30 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
Subscore				0
B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface water migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
Subtotals			44	108
Subscore (100 x factor score subtotal/maximum score subtotal)				41
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	2	8	16	24
Subtotals			54	114
Subscore (100 x factor score subtotal/maximum score subtotal)				47
C. Highest pathway subscore.				
Enter the highest subscore value from A, B-1, B-2 or B-3 above.				
Pathways Subscore				47

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	52
Waste Characteristics	24
Pathways	47
Total 123 divided by 3 =	41
Gross Total Score	

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

41 x 1.0 = 41

HAZARDOUS ASSESSMENT RATING FORM

Page 1 of 2

NAME OF SITE Site No. 3 - Shipping/Receiving AreaLOCATION 350 feet west of Site No. 2

DATE OF OPERATION OR OCCURRENCE _____

OWNER/OPERATOR West Virginia Air National Guard

COMMENTS/DESCRIPTION _____

SITE RATED BY Hazardous Materials Technical Center

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 1 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 1 miles of site	1	6	6	18
Subtotals			94	180
Receptors subscore (100 X factor score subtotal/maximum score subtotal)				52

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large)

M

2. Confidence level (C = confirmed, S = suspected)

C

3. Hazard rating (H = high, M = medium, L = low)

M

Factor Subscore A (from 20 to 100 based on factor score matrix)

60

B. Apply persistence factor

Factor Subscore A X Persistence Factor = Subscore B

$$\underline{60} \times \underline{1.0} = \underline{60}$$

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

$$\underline{60} \times \underline{1.0} = \underline{60}$$

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 30 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
Subscore				0
B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface water migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
Subtotals			44	108
Subscore (100 X factor score subtotal/maximum score subtotal)				41
2. Flooding				
	0	1	0	3
Subscore (100 X factor score/3)				0
3. Ground water migration				
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	3	8	24	24
Subtotals			62	114
Subscore (100 X factor score subtotal/maximum score subtotal)				54
C. Highest pathway subscore.				
Enter the highest subscore value from A, B-1, B-2 or B-3 above.				
Pathways Subscore				54

IV. WASTE MANAGEMENT PRACTICES

- A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	52
Waste Characteristics	60
Pathways	54

Total 166 divided by 3 = 55

Gross Total Score

- B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

$$55 \times 1.0 = 55$$

HAZARDOUS ASSESSMENT RATING FORM

Page 1 of 2

NAME OF SITE Site No. 4 - Fire Training AreaLOCATION Western Corner of the AirportDATE OF OPERATION OR OCCURRENCE 1959-1985OWNER/OPERATOR West Virginia Air National Guard

COMMENTS/DESCRIPTION _____

SITE RATED BY Hazardous Materials Technical Center

1. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	1	6	6	18

Subtotals 86 180

Receptors subscore (100 X factor score subtotal/maximum score subtotal)

48

11. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large)

L

2. Confidence level (C = confirmed, S = suspected)

C

3. Hazard rating (H = high, M = medium, L = low)

M

Factor Subscore A (from 20 to 100 based on factor score matrix)

80

B. Apply persistence factor

Factor Subscore A X Persistence Factor = Subscore B

80 x 1.0 = 80

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

80 x 1.0 = 80

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 30 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
Subscore				0
B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
Subtotals			52	108
Subscore (100 x factor score subtotal/maximum score subtotal)				48
2. Flooding				
	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	2	8	16	24
Subtotals			54	114
Subscore (100 x factor score subtotal/maximum score subtotal)				47
C. Highest pathway subscore.				
Enter the highest subscore value from A, B-1, B-2 or B-3 above.				
Pathways Subscore				48

IV. WASTE MANAGEMENT PRACTICES

- A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	48
Waste Characteristics	80
Pathways	48
Total 176 divided by 3 =	59
Gross Total Score	

- B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

$$59 \times 1.0 = 59$$

Appendix D

OEHL Test Results

APPENDIX D

Part A

USAF OEHL

Brooks AFB, Texas

- EPA Method, 8010 (Volatile Halocarbons)

Sample Nos. - GS850018, GS850019 and GS 850024 taken from Temporary Hazardous Waste Storage Area (Site No. 2)

Sample Nos. - GS850020, GS850021, GS850022, GS850023 and GS850025 taken from Shipping/Receiving Area (Site No. 3)

LABORATORY ANALYSIS REPORT AND RECORD

15 Aug 85

FROM: USAF OEH/SA BROOKS AFB TX 78235-3508		DATE RECEIVED 12 July 85
SAMPLE FROM Martinsburg, W, Va.		LAB CONTROL NO.

TEST FOR

Volatile Halocarbons

Methodology: EPA Method 8010

OEH LO:	45192	45195	45196	45198	45200	DFT.
BASE NO:	63850018	63850019	63850020	63850021	63850022	LIMIT
Bromodichloromethane	ND#1	ND#2	ND#3	ND#4	ND#5	0.1
Bromoform						0.2
Bromomethane						1.0
Carbon Tetrachloride						0.1
Chlorobenzene						0.2
Chloroethane						0.5
2-Chloroethylvinyl ether						0.1
Chloroform						0.1
Chloromethane						0.1
Dibromochloromethane						0.1
1,2-Dichlorobenzene						0.2
1,3-Dichlorobenzene						0.2
1,4-Dichlorobenzene						0.2
Dichlorodifluoroethane						0.1
1,1-Dichloroethane						0.2
1,2-Dichloroethane						0.2
1,1-Dichloroethene						0.1
trans-1,2-Dichloroethane						0.1
1,2-Dichloropropane						0.1
cis-1,3-Dichloropropene						0.2
trans-1,3-Dichloropropene						0.2
Ethylene Chloride						0.2
1,1,2,2-Tetrachloroethane					ND	0.1
Tetrachloroethylene					190	0.1
1,1,1-Trichloroethane					ND	0.1
1,1,2-Trichloroethane						0.1
Trichloroethylene						0.1
Trichlorofluoromethane						0.1
Vinyl Chloride	ND	ND	ND	ND	ND	0.2

Results in Micrograms per Liter

DATE ANALYZED: 19 July 85

Analyzed by Contract
Lab;

Edward F. Brown
15 Aug 85

REQUESTING AGENCY (Shipping Address)

167 TAG/SGAB
EWVRA - Shepherd Field
Martinsburg, W. Va 20401

ND-NONE DETECTED, LESS THAN THE DETECTION LIMIT.

TRACE-PRESENT BUT LESS THAN THE QUANTITATIVE LIMIT.

TRACE = 2 times Detection Limit.

15 Aug 85

FROM: USAF OEH/SA
BROOKS AFB TX 78235-3502

IDENTITY

DATE RECEIVED

WATER

12 July 85

SAMPLE FROM

LAB CONTROL RM

167 TAG Martinsburg W. Va

TEST FOR

Volatile Halocarbons

Methodology: EPA Method 8030

0. RL NO:	45202	45204 ✓	45206			DET.
BASE NO:	6N850023	6N850024	6N850025			LIMIT
Bromodichloromethane	ND*6	ND*7	ND*8			0.1
Bromoform						0.2
Chloromethane						1.0
Carbon Tetrachloride						0.1
Chlorobenzene						0.2
Chloroethane						0.5
2-Chloroethylvinyl ether						0.1
Chloroform						0.1
Chloromethane						0.1
Dibromochloromethane						0.1
1,2-Dichlorobenzene						0.2
1,3-Dichlorobenzene						0.2
1,4-Dichlorobenzene						0.2
Dichlorodifluoromethane						0.1
1,1-Dichloroethane						0.2
1,2-Dichloroethane						0.2
1,1-Dichloroethane						0.1
trans-1,2-Dichloroethane						0.1
1,2-Dichloropropane						0.1
cis-1,3-Dichloropropene						0.2
trans-1,3-Dichloropropene						0.2
Ethylene Chloride						0.2
1,1,2,2-Tetrachloroethane			ND			0.1
Tetrachloroethylene			IS			0.1
1,1,1-Trichloroethane			ND			0.1
1,1,2-Trichloroethane						0.1
Trichloroethylene						0.1
Trichlorofluoromethane						0.1
Vinyl Chloride	ND	ND	ND			0.2

Results in Micrograms per Liter

DATE ANALYZED: 19 July 85

R Analyzed by
Contract Lab.Edward J. Brown
15 Aug 85

REQUESTING AGENCY (Shipping Address)

167 TAG/5GPD

ENVRFA - Shepherd Field

Martinsburg, W Va. 25401

ND-NONE DETECTED, LESS THAN THE DETECTION LIMIT.

TRACE-PRESENT BUT LESS THAN THE QUANTITATIVE LIMIT.

TRACE = 2 times Detection Limit.

APPENDIX D

Part B

USAF OEHL

Brooks AFB, Texas

- EPA Method 8020 (Volatile Aromatics)

Sample Nos. - GS850018, GS850019 and GS850024 taken from Temporary Hazardous Waste Storage Area (Site no. 2)

Sample Nos. - GS850020, GS850022, GS850023 and GS850025 taken from Shipping/Receiving Area. (Site No. 3)

LABORATORY ANALYSIS REPORT AND RECORD (General)					DATE 14 AUG 84	
TO			FROM USAF OEHL/SA Brooks AFB TX 78235-5501			
SAMPLE IDENTITY Water					DATE RECEIVED 12 June 85	
SAMPLE FROM 167th TAG Martinsburg, W. Va					LAB CONTROL NR	
TEST FOR Volatile Aromatics						
Methodology: EPA 8020						
OEHL NO:	45192	45195	45197	45199	Detection Limit	
BASE NO:	65850018 ^{H1}	65850019 ^{H2}	65850020 ^{H3}	65850021 ^{H4}	ND	TR
Benzene	ND	ND	ND	ND	2.0	4.0
Chlorobenzene					2.0	4.0
1,2-Dichlorobenzene					2.0	4.0
1,3-Dichlorobenzene					2.0	4.0
1,4-Dichlorobenzene		ND	ND	ND	2.0	4.0
Ethylbenzene	ND	5.2	4.0	2.3	2.0	4.0
Toluene	ND	ND	ND	ND	2.0	4.0

Results in micrograms per liter.

ND-None Detected. Less than the detection limit.

TRACE-Present but less than the quantitative limit.

DATE ANALYZED: **19 July 85**

Analysis Done by
Contract Lab

Edward J. Brown
14 AUG 1985

REQUESTING AGENCY (Mailing Address)

167 TAG / SGPB
ENVRA - Shepherd Field
Martinsburg W. Va. 25405

LABORATORY ANALYSIS REPORT AND RECORD (General)					DATE 14 Aug 85	
TO			FROM USAF OEHL/SA Brooks AFB TX 78235-5501			
SAMPLE IDENTITY Water					DATE RECEIVED 12 June 85	
SAMPLE FROM					LAB CONTROL NR	
TEST FOR Volatile Aromatics Martinsburg W.V.						
Methodology: EPA 8020						
OEHL NO:	45201	45203	45205	45207	Detection Limit	
BASE NO:	^{M5} 6N850022	^{M6} 6N850023	^{M7} 6N850024	^{M8} 6N850025	ND	TR
Benzene	ND	ND	ND	ND	2.0	4.0
Chlorobenzene					2.0	4.0
1,2-Dichlorobenzene					2.0	4.0
1,3-Dichlorobenzene					2.0	4.0
1,4-Dichlorobenzene			ND	ND	2.0	4.0
Ethylbenzene			6.4	6.9	2.0	4.0
Toluene	ND	ND	ND	ND	2.0	4.0

Results in micrograms per liter.

ND-None Detected. Less than the detection limit.
TRACE-Present but less than the quantitative limit.

DATE ANALYZED: **19 July 85**

Edward J. Brown

* Analysis Done By Contract Lab

14 AUG 1985

REQUESTING AGENCY (Mailing Address)
167TAG/STPB
EWVRA - Shepherd Field
Martinsburg W.V. 25401

Appendix E
Resumes of Search
Team Members

WILLIAM D. EATON

EDUCATION

M.S., hydrogeology/environmental sciences, University of Virginia, 1983
B.A., geology, Susquehanna University, 1978

EXPERIENCE

Eight years of technical, management and field experience in hydrogeology. Involved in projects related to installation of groundwater monitoring wells for the determination of rates of contaminant migration and extent of groundwater contamination resulting from leaking underground storage tanks, uncontrolled hazardous waste disposal sites, and ruptured surface storage tanks. Expertise in groundwater contamination associated with military activities such as fire training exercises and POL, AGE, and NDI activities. Served as the hydrogeologist and principal investigator on four different Installation Restoration-Phase I studies conducted for the Air Force. Through such projects, acquired experience in assessing the health hazards associated with hazardous waste disposal/spill sites, using assessment models such as the Air Force's HARM model and EPA's Hazard Ranking System. Acted as the hydrogeologist and principal investigator in charge of conducting groundwater assessments and remedial alternative studies for nine hazardous waste disposal/spill sites owned by the Navy. These remedial alternative studies included developing cost-estimates and estimates of contaminant transport rates using analytical advection-dispersion models.

EMPLOYMENT

Dynamac Corporation (1983-present): Hydrogeologist

Primarily responsible for describing the hydrogeological characteristics of various hazardous waste sites on military installations throughout the United States in support of the DOD Hazardous Materials Technical Center. Specific duties include: delineation of the extent to which groundwater near the site has been contaminated and the identification of those areas which warrant priority attention; providing technical input regarding cleanup activities to prevent further groundwater contamination; and defining remedial actions to encourage reclamation of the contaminated aquifers and/or unsaturated zones. Preparation of contract specifications for the Remedial Action phase of DOD's Installation Restoration Program (IRP).

University of Virginia (1980-1983): Graduate Teaching Assistant

Taught hydrogeology to undergraduate students while performing research on the bacterial degradation of bromobenzene in simulated groundwater.

R.E. Wright Associates, Inc. (1978-1980): Staff Geologist

Managed project teams involved in groundwater development, environmental geology, and toxic chemical spills, and engineering geology. Has participated in several environmental geology studies dealing with groundwater contamination by organic chemical spills, gasoline and related petroleum products. Responsibilities included implementation of groundwater monitoring, product recovery, and groundwater treatment procedures within diabase, shale, and sandstone subsurfaces, and groundwater development. Organized drilling operations, designed pollutant recovery techniques, and analyzed physical and chemical groundwater data. Has participated in groundwater development projects to determine optimum locations for municipal water wells in terms of water quality, quantity and economic feasibility. For engineering geology projects, has performed fracture trace and lineament analyses related to the prevention of roof failures in underground coal mines and the determination of optimal locations for natural gas wells.

PROFESSIONAL AFFILIATION

Sigma Xi Research Society

PUBLICATIONS/PRESENTATIONS

Changes in Rates of Bacterial Degradation of Bromobenzene in Simulated Groundwater as Effected by Bromobenzene Sorption to SiO_2 and Organic-rich Lake Sediment. Presented at the annual meeting of the American Society for Microbiology, New Orleans, Louisiana, March 1983.

Effect of particles on degradation of bromobenzene in a simulated groundwater environment. Biodegradation, Vol. 6, in press.

Co-authored poster session entitled, "An Engineering Method for the Development of Plans and Cost Estimates for Cleanup of a Hazardous Waste Site," presented at the National Conference on Environmental Engineering, Los Angeles, California, June 1984.

Two methodologies to assess hazardous waste sites. Newsletter of the Hazardous Materials Technical Center, 3(3), 1984.

TIMOTHY N. GARDNER

Environmental Scientist

EDUCATION

M.A., Environmental Biology, Hood College
B.S., Forestry/Resource Management, West Virginia University

EXPERIENCE

Mr. Gardner has five years of technical experience in environmental control and research, with emphasis on risk assessment, chemical safety, radiation safety, hazardous waste management (chemical and radiologic), and activated carbon filtration research. His past responsibilities include site risk assessment, chemical and radioactive waste pickup and storage for disposal at a large cancer research facility, and chemical and radioactive spill control, as well as safety surveys and technical assistance in activated carbon desorption research.

EMPLOYMENT

Dynamac Corporation (1984-Present): Staff Scientist

At Dynamac, Mr. Gardner's responsibilities include site surveys and records searches for the Phase I portion of the Installation Restoration Program (IRP) for various Air National Guard Bases. Efforts include risk assessment, site prioritization, and remedial action recommendations. He has also been a contributing author for a closure-post closure plan for a hazardous waste landfill at Clovis AFB, plans and specifications for the removal of asbestos at several Air Force White Alice sites in Alaska, and the update and revision of a DLA regulation for "Disposal of Unwanted Radioactive Material."

NCI-Frederick Cancer Research Facility (1981-1984): Lab Technician

Mr. Gardner worked in radiation and chemical safety as well as environmental research. His responsibilities included monitoring personal and environmental air quality at work areas where free iodinations occurred, monitoring work areas and equipment for isotope contamination, periodic surveys to monitor compliance with NRC safety regulations, isotope inventory control, transfer of isotopes between licenses, and periodic calibration and maintenance of survey instruments. He was also responsible for radioactive and chemical waste pickup and storage for disposal, and served as an advisor for safety-related matters pertinent to radiation and radioactive waste, chemical safety, and industrial hygiene. In the environmental research division, he was involved in activated carbon desorption studies involving the use of analytic laboratory equipment.

PROFESSIONAL AFFILIATIONS

American Tree Farm Association
Hardwood Research Council
West Virginia Forestry Association

LAWRENCE I. GREENFELD

EDUCATION

B.S., soil science, University of Maryland
Engineering courses, Stevens Institute of Technology

EXPERIENCE

Ten years of experience performing investigations, critical data analyses and evaluations in support of environmental legislation. Expertise has been developed working in the public and private sectors as well as in university and quasi-governmental settings. Has prepared documents for EPA that examine the safe disposal of hazardous wastes. Currently reviewing data on toxic chemicals/wastes.

EMPLOYMENT

Dynamac Corporation (1985-present): Staff Scientist

Currently critically reviewing data on toxic chemicals, and is responsible for specifying requirements for the safe disposal of hazardous wastes at military installations as required by RCRA and state laws. Specifications are also for the procedures to be followed by the facility owners/operators to be in compliance with closure and postclosure requirements when disposal of hazardous waste is to cease. Clients have included the U.S. Army Corps of Engineers and the U.S. Air Force Tactical Air Command.

U.S. Environmental Protection Agency (1982-1985): Environmental Scientist, Office of Drinking Water and Office of Solid Waste

Co-author of the "Class I (Hazardous) Underground Injection Well National Assessment Report" requested by Congress.

Author of the Guidance to be followed by the state and regional offices detailing procedures for conducting Class V (nonhazardous) injection well assessments required by the underground injection control (UIC) regulations.

Revised technical and policy documents to ensure that the needs of the UIC programs were met and to accurately reflect regulations under the Safe Drinking Water Act and the Resource Conservation and Recovery Act.

Author of the paper entitled, "Rocky Mountain Arsenal - Groundwater Contamination Remedial Action," which is one of the first documents to address the cost-effectiveness of corrective action technologies at hazardous waste disposal facilities.

Developed the "Hazardous Waste Underground Injection Well Questionnaire" used by OSW at site investigations and for mailouts to hazardous waste disposal facilities pursuant to the Regulatory Impact Analysis of Part 264.

Performed site investigations and administered land disposal technology questionnaires at hazardous waste disposal facilities as part of the data gathering efforts essential to the Regulatory Impact Analysis of Part 264.

Co-author of the "Land Treatment RCRA Guidance Document," the draft of which accompanied the Part 264 Land Disposal Regulations Package.

Versar, Inc. (1979-1982): Environmental Scientist

Author and principal investigator of the report entitled, "Lead Concentrations in Soil Samples near N.L. Industries" which evaluated the results of extensive sampling and analyses done by the New Jersey Department of Environmental Protection of the soils surrounding a lead smelter that had been repeatedly in violation of federal and state laws. Recommendations submitted to the U.S. Environmental Protection Agency (EPA).

Author and principal investigator of "Revegetation of Coal Strip Mines" -- a report submitted to EPA which analyzed the effectiveness of a number of different vegetative land reclamation schemes, as well as compared the cost-benefits of each scheme.

Investigator and co-author of the EPA published report No. SW-796, "Status of State Programs for Hazardous and Solid Waste Management," which analyzed the progress the states had made towards the implementation of the Resource Conservation and Recovery Act of 1976 (PL 94-580).

Soils investigator and co-author of a series of reports submitted to the U.S. Department of the Interior that evaluated onsite conditions of abandoned coal mines in Georgia, and recommended reclamation alternatives under the authority of the Surface Mining Control and Reclamation Act of 1977 (PL 95-87).

Co-director of site investigations and field survey activities essential to Versar's monitoring of non-point source pollutant loadings in the Chester River Basin. (This work by Versar for Texas Instruments was part of the larger non-point source pollution study of the Chesapeake Bay that was coordinated by EPA and implemented by the State of Maryland.)

Earlier Employment (1975-1979): Soil Scientist

The Metropolitan Washington Council of Governments - Consolidated regional soil survey and land-use information to plan the abatement of non-point source pollution into the Potomac River Basin as required by the Water Pollution Control Act (PL 92-500). Analyzed and compared erosion and sediment control legislation at several jurisdictional levels to form regional environmental policies.

Soil Conservation Service (USDA) - Approved and designed construction site soils engineering control measures (especially sediment control and storm water management) based on field evaluations, laboratory analyses, and site plan specifications. (Implemented regulations under PL 92-500.)

The George Washington University - Developed new techniques for researching several physical properties of sediment particles (under a grant from the National Science Foundation) and determined the validity of other research methods that were established previously.

PROFESSIONAL AFFILIATION

The Soil Conservation Society of America

SHARI A. SAMUELS

EDUCATION

B.S., safety management, Indiana University of Pennsylvania, 1983

EXPERIENCE

Experienced in developing and evaluating safety policies, procedures, and emergency response programs. Conducted safety, occupational health, and fire protection hazard assessments. Knowledge of and experience with environmental sampling equipment, such as sound level meters and dosimeters, heat stress instruments, and air sampling devices.

EMPLOYMENT

Dynamac Corporation (1984-present): Junior Safety Specialist

Technically reviews material safety data sheets to be entered into the Department of Defense's Hazardous Materials Information System (HMIS). Evaluated and recommended personal protective equipment for safe handling of demilitarized chemical warfare agents at Rocky Mountain Arsenal, Colorado. Prepared emergency response and work safety procedures for asbestos and other hazardous waste removal due to the demolition of Alaskan Air Command sites. Also prepared emergency response and work safety procedures, regulatory requirements, and sampling and analytical work procedure for the closure of underground storage tanks, Sacramento Army Depot, California.

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